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AND

SCIENTIFIC AND LITERARY REVIEW,

A RECORD OF PROGRESS IN ARTS, INDUSTRY, AND MANUFACTURES,

INCORPORATING THE

Journal of the Inventors' Institute.

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VOL. XII.—No. 3.] [THIRD SERIES.] MARCH 1, 1877. [PRICE 6d.

*** *Communications to the Editor to be addressed to him at 21, Cockspur Street.*

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Reviews.

BRINSMEAD ON THE PIANOFORTE.

"The History of the Pianoforte, with an account of Ancient Music and Musical Instruments." By Edgar Brinsmead. London, Paris, and New York: Cassell, Petter, and Galpin.

This is a pleasant and instructive little book, conveying much information on a subject of very general interest. It opens with a Sketch of the History of Music, and the second chapter treats of the Stringed Musical Instruments of the Ancients, the subsequent chapters having reference to the First Instruments with the Pianoforte Keyboard—the Clavicytherium, Clavichord, Virginal, Spinet, Harpsichord, &c., the Invention and Progress of the Pianoforte, Progress of the Pianoforte from its Introduction into England, Invention and Progress of the Upright Pianoforte, Construction of the Pianoforte, Hints upon Selecting, and Practical Directions for Tuning Pianos, and Repairing Small Defects; whilst in an appendix the Inventions Patented between the Years 1693 and 1876 A.D. are enumerated.

Mr. Brinsmead is so succinct, yet comprehensive, that it is scarcely possible to do more than give a general notice of the contents of the book; we will, however, make two extracts. In reference to the First Instruments with Pianoforte Keyboard, he says:—"M. Fétis, in his 'Sketch of the History of the Pianoforte,' refers to the numberless attempts to make the harpsichord capable of expression in playing. He says, 'Harpsichords were constructed with more than twenty different modifications to imitate the sound of the harp, the flute, the mandoline, the bassoon, flageolet, oboe, violin, and other instruments. In order to produce these different effects, new rows of jacks were added, which were furnished with materials of the softest kind and most conducive to expression; and yet, with all the complication of stops, springs, extra rows of keys, and Venetian swells over the strings, the grand secret—the real shading of the *piano* and *forte*—were still wanting. Nothing better was devised for augmenting or dimishing the sound than to put in motion different rows of jacks, so as to withdraw them from or approximate them to the strings at pleasure.' Godfrey Silbermann, of Freyburg, made several improvements in the harpsichord about the middle of the eighteenth century, especially in the keyboard, which he extended, and in the touch, which he lightened. He also revived the clavichord in a slightly altered form, thus taking a step towarus producing the pianoforte; for in this instrument, the *clavecin d'amour*, the strings were *struck* as in the old clavichord, but struck and pressed up exactly in the middle of each string by the brass wedge, which formed a middle bridge, allowing the string to vibrate in the lengths behind and in front of it. This was a step in the right direction, although it was a step back; but was not followed by other striking mechanism for some years.

Our best English makers were the Haywards, and John Hitchcock, and after them, Keen, Slade, John Harris, and Rutgerus Plenius, who invented the lyrichord in 1741. This instrument, which was intended to imitate stringed bow instruments, was played upon by means of a keyboard and a treadle, which turned a circular bow used for vibrating the strings when pressed near by the keys' mechanism. This invention has recently been revived in a slightly modified form under the name of the *piano quatuor*.

Tabel introduced some ingenious improvements; but one of his foremen, Burckhardt Tschudi, or Schudi, acquired a still greater reputation. Another of his workmen, Jacob Kirkman, also became a celebrated manufacturer, and he was the means of restoring the harpsichord to the favour the guitar temporarily usurped. Burney, in Rees' Cyclopædia, article 'Guitar,' says that the common guitar was so much in vogue among all ranks of people as nearly to break the harpsichord and spinet manufacturers, all the ladies selling their harpsichords for a third their cost, till Kirkman, after almost ruining himself by buying up these instruments for better times, made a present of a number of cheap guitars to girls in milliners' shops and ballad singers, who, singing their songs in the streets to the few accompaniments he taught them, soon made the ladies ashamed of their frivolous and vulgar taste, and return to the harpsichord.

The compass of the harpsichord was at first only three octaves; it gradually extended to five—from double F below the bass to F in altissimo.

The harpsichord, although so universal an instrument, was gradually supplanted by the pianoforte, when that instrument came into public favour, and Moscheles, when giving his *Soirées Musicales* in 1838, had very great difficulty in finding one upon which to perform some of the lessons of Scarlatti, Handel, and Bach."

In regard to the construction of the pianoforte, the following is noteworthy:—

"As the tone of the piano depends greatly upon the sounding-board, which continues the vibrations of the strings, the greatest care is necessary, not only in the manufacture, but also in the selection of the wood. The best fir from Switzerland, which must be perfectly free from knots or flaws, is split in a particular way of the grain—each split radiating from the centre—and planed into thin boards. These boards are glued together, and strengthened on the under side, with small ribs or bars. After having been varnished on the under side, the edges of the sounding-board are attached to the framing of the instrument, so as to leave the whole of the middle portion free to vibrate under the impulse of the strings when in vibration. The sounding-board is then cleaned off and varnished several times, to preserve it and increase its vibrating power.

These parts are all subdivided in manufacture.

When the bridges have been glued on, and the distances and lengths for the strings *marked off* and pinned, the case is ready for the stringer, who puts on the strings and drives in the wrest-pins, in which they are first threaded and wound round in four or five coils. The treble and tenor strings are now made of steel instead of brass, and the bass strings are of steel wire, with copper wire tightly and closely wound round them, thus making up in thickness for their want of proper length. After the key-bottom, the ends and cheeks have been attached to the back, and the case having been tuned by *chipping up* or snapping the strings instead of striking them by means of the action, the case is ready for the *finisher*. The *action*, or internal mechanism, is then put in, and this part of the work is one of the most important; for, as Dr. Lardner observes, 'When it is considered that all the delicacies of expression and articulation, and all the lights and shades of the performance, depend upon the precision, certainty, and promptitude with which the hammer responds to the touch of the finger, the immense importance of the mechanism of the key will be duly appreciated. Yet it is a curious fact in the records of the progress of this instrument that the mechanism of the key has been the last part of it to which invention has imparted perfection; and that, even in the present time, notwithstanding the advanced state of the musical art, and the all but universal cultivation of the pianoforte, the key mechanism, in a very large proportion of the instruments in circulation, is constructed on imperfect principles, and is consequently productive of unsatisfactory results.' Dr. Lardner then proceeds to prove that the performance of Thalberg's fantasia on the prayer in "Mosé in Egitto," upon a piano with the common English action, gives an amount of labour which, if applied to lift a weight, would suffice to raise *above eighty-four pounds* a foot high! This fact, startling as it is to fair pianists, demonstrates the advantage of having mechanism which does not require such a tax on the performer's physical power. Sebastian Erard's grand repetition action is justly regarded as the perfection of mechanism in everything except its complication, the touch and tone produced by it being perfect. John Brinsmead and Sons' repetition action also produces precisely the same effects, but by extremely simple means, and in the upright as well as in the grand piano.

The finisher receives the keys and various parts of the action from their respective makers, and fits them together, fixes the action in its place, and brings the whole of the mechanism generally into playing order. The *rougher-up* then tunes the piano with the action in it, and the *regulator* adjusts every part of the action, to complete the regulation of the touch. The instrument having been tuned several times, the *toner* now examines the hammers, and corrects all inequalities and irregularities, making the sound of the instrument perfect and regular throughout.

GIBBS ON VACCINATION.

"How and How Much the 'Disease of Diseases' is propagated by Vaccination." In a letter to Mrs. Richard Butler Gibbs, Hon. Secretary of the Mother's Anti-Compulsory Vaccination League. By George S. Gibbs, Fellow of the Statistical Society. London: Published by the Mothers' Anti-Compulsory Vaccination League.

This tractate is worth the attention of all those who are sufficiently devoid of scientific bigotry (of whom we have many amongst the readers of the Scientific Review and Journal of the Inventors' Institute), to consider no fair argument against any system however well established, as unworthy of attention. For Mr. Gibbs shews that by the admission of such competent authorities as M. Ricord, the eminent French physician, Dr. Ballard, Mr. Hutchinson, and Dr. B. W. Richardson, that what he terms the disease of diseases has been, and is, propagated by vaccination, which Mr. Gibbs, by his tables, founded upon what has been estimated by Dr. Richardson makes out to be a yearly average of *one thousand one hundred and forty cases* in *London alone*, or for the whole of England 7,931. All this, as he pertinently observes with the view of abolishing the small-pox, which obstinately refuses to be abolished, since in these ten years, it has taken off in London 15,080, and in England 34,895 victims!

"THE ANALYST."

"The Analyst: including the Proceedings of the 'Society of Public Analysts.' Published Monthly. Jan. 31st, 1877."

This is a publication deserving general support. That it contains matter of high interest, the following statement as to its contents will show, viz:—The adulteration of peas; the "Society of Public Analysts'" Extraordinary Meeting, Report of Council, Ordinary Meeting; on colouring matters in wine, by A. Dupré, Ph. D., F.R.S., &c.; the admixture of oatmeal with barley meal, by E. L. Cleaver, F.C.S.; on the estimation of Salicylic acid, by Dr. Muter, M.A., F.C.S. Amongst the above subjects, the following seems specially interesting:—

Note on the Detection of Various Colouring Matters in Wine.—By A. Dupré, Ph.D., F.R.S.—Read before the Society of Public Analysts at Burlington House, on 17th January, 1877.—From time to time the public is alarmed by sensational statements about the extent to which the fraudulent colouration of wines is carried on, and the poisonous nature of the substances alleged to be employed for this purpose. I am strongly inclined to believe that all such statements are gross exaggerations, and shall be greatly obliged to any one who will send me a bottle of red wine, bought from an English wine merchant, which owes its colour to anything else than the colouring matter of the grape. I have not as yet met with a single sample of the kind. These statements, however, having been made, methods for the detection of foreign colouring matters in wine have to be devised, were it only to allay the fears of the public. At the meeting of this Society in January last, I read a short communication on this subject. I then showed that, whereas the colouring matter of a pure wine is almost incapable of dialysis through parchment paper, several of the colouring matters, said to be employed for the fraudulent colouration of wine, dialyse readily. When carefully conducted the process yields reliable results, but in practice it is open to these objections. It is not possible always to secure parchment paper of the same substance, and the rate at which one and the same colouring matter dialyses through different papers varies accordingly; besides this, most sheets have spots in which the paper is very much thinner than it is over the sheet generally, and if such spots are overlooked they may seriously interfere with the success of the experiment; lastly, it requires great care to avoid the intermingling of the liquids, in and outside the dialyser, by capillary action. To obviate these difficulties I now adopt the following plan. Instead of putting the wine into a dialyser, I put into the wine a small cube of jelly about ¾ in. square. (These cubes are made by dissolving 5 grms. gelatine in 100 c.c. of warm water, and pouring the solution into a square flat mould made of paper, of such a size as to yield a plate of jelly about ¾ in. thick. From this plate the cubes are cut with a sharp wet knife). After the lapse of from 24 to 48 hours the cube is taken out and washed slightly, and a slice is cut out through the centre of the cube and in a direction parallel with one of its sides. I prefer to cut the slice parallel with the side on which the cube has rested. This slice is now examined either by being placed on a glass slide which is then held up towards the light, or by placing it upon a sheet of white paper. If the wine was pure the colour will be confined almost entirely to the edges of the slice, or will have penetrated more than from 1-16th in. to ⅛ in. into the jelly. The case is widely different if any one of the colouring matters given below, under group *b*, was present. It will then be found that the colour has penetrated more or less deeply into the jelly, frequently to the very centre, and may, in many cases, be recognized by its characteristic colour, which is more distinct in the jelly than it was in the wine. Thus rosaniline imparts to the jelly a beautiful red colour, a somewhat similar colour is imparted by the red colouring matter extracted from beet-root and red cabbage. Logwood colours the jelly yellowish brown, indigo blue, &c., &c. In many cases the nature of the foreign colouring matter present may thus be detected by the colour of the jelly. In some cases the slice may be examined spectroscopically with good effect, in the cases of rosaniline, red cabbage, and beet root, for example. In others again the action of dilute ammonia on the coloured slice will yield characteristic results, such as declourising the rosaniline slice, turning the red cabbage slice beautifully dark green, the logwood slice dark brown, &c. In the case of logwood and cochineal the ammonia dissolves much colour from the slice, in the case of rosaniline, red cabbage, and beet root, the ammonia remains almost, if not quite, colourless. Similar tests will readily suggest themselves to every chemist. In some cases it might, for example, be found advantageous to add some chemical such as alum or borax, to the jelly, and to observe the effect which these have on the colouration of the jelly. Group *a*,—Colouring matters that penetrate but slowly into the jelly.—Colouring matter of pure wine; colouring matter of Rhatany root. Group *b*,—Colouring matters that penetrate rapidly into the jelly. — Rosanile, Cochineal, Logwood, Brazilwood, Indigo, Litmus, Red cabbage, Beet root, Malva sylvestris, Althea officinalis. An adition of 10 per cent. of any of the colouring matters of group *b*, to a claret of ordinary colour, is sufficient to yield very distinct results, in the case of logwood 5 per cent. is enough, while of rosaniline only 1 per cent. is required. By an addition of 10 per cent. of colouring matter, I understand that 1-10th of the intensity of colour in the mixture is due to the colouring matter added. I have not been able to procure any of the colouring matter, or of the flower, of the hollyhock (*althea rosea*) said to be largely used in France for the fraudulent colouration of wines. As I find, however, that the colouring matters from Malva sylvestris and Althea officinalis, the flowers of which I obtained through the kindness of Mr. Holmes, of the Pharmaceutical Society, readilly penetrate the jelly, I expect that the colouring matter of hollyhock will do the same. I hope soon to be able to continue these experiments with other colouring matters, and should be greatly obliged to any one who would furnish me with any colouring matter, known, or suspected, to be used in the fraudulent colouration of wine. In conclusion, I would express the hope that some of our members may be induced to take this subject up and give us their experience at some of our future meetings. Any such process can only be placed on a sufficiently wide and secure basis by being tried and tested by a number of workers. After a short discussion, Dr. Duprè said, in the presence of wine the action of ammonia on various colouring matters is considerably altered, and by itself is an extremely unreliable test, although in conjunction with the spectroscope it sometimes yields good results. I have not as yet examined the colouring matters from elderberries, or cherries, but hope to do so soon. I am also, I am sorry to say, entirely ignorant of the nature of the wonderful test paper lately brought forward by a French chemist.

GUILLEMIN ON COMETS.

"The World of Comets." By AMEDEE GUILLEMIN. Translated and Edited by JAMES GLAISHER, F.R.S. Sampson Low and Co.

MR. GLAISHER has done well in bringing out the present translation of M. Guillemin's work. His name guarantees the faithfulness of the version, carefulness of revision, and value of the editorial notes. He has enriched the work by the insertion of engravings of some of Dr. Warren De La Rue's beautiful drawings of the great comet of 1861, which have been placed at his disposal for that purpose.

FOREIGN SCIENCE.

IN the last number we gave an account of new means of rapidly drying buildings—a subject which, viewing the inconvenience and danger resulting from dampness in British dwelling-houses, at any rate, may be well recommended to clever or ingenious men. This time we have to refer to a subject equally of general interest,—the traction of conveyances.

A M. Anthoni writes to *Les Mondes* in consequence of an article which appeared on elastic traction, described as a novelty imported into Germany. Anthoni is an old-established carriage-builder. He says that for a long time spring steel bars have been formed of plates with springs, giving the same result as the menage chevaux (horse manager). This was quite French. To diminish resistance to traction suspension must be perfected, because then traction is so much easier. He had accomplished this improvement within the last two years, and obtained a good result. A carriage should be suspended in every direc-so that shocks due to the inequalities on the ground are defeated, and not only the draught diminished to its minimum, but the suspension rendered as easy as in carriages with 8 springs. The price is insignificant relatively to that of carriages with 8 springs. The improvement can be applied to either new or old vehicles.

In relation to the speed of the wind, observations have been made with success for some time at the Roman College. The instrument employed was Robinson's anemometer. Thus the mean daily speed, the monthly and annual and the hourly, speed for each day in the year was calculated. Measuring instruments take up a good deal of attention at present. As to the radiometer, Père J. Delsaux addresses a lengthy note, from which it may be gathered that the theory of the phenomena of the radiometer has made a great advance. The Père is not at all convinced that the reaction of the wings due to the passage of the heat is the only one which it is necessary to consider. In many circumstances the face, which is relatively cold, is repulsed, and the most heated face opens the action. M. M. Alvergniat supports this theory, but on most points the writer gives pre-eminence to Mr. Crookes, who has constructed an instrument with silvered copper wings polished on one of the faces, and covered with smoke black on the other. It turns directly under the influence of the radiation of a taper, and in the reverse way under that of a screen of heated glass; also in a direct way under that of a rough chilling. Mr. Crookes appropriately says that these phenomena are very difficult to explain by the principle hitherto adopted. M. Cailtetet has been exerting himself in regard to the manometer for measuring strong pressures. As to the resistance of the glass tubes before breaking, (1) the quantity which the volume of a cylindrical reservoir in glass, compressed on its exterior sides varies, proportionate to the pressure exercised; (2) in the glass not undergoing permanent defornment. On the advice of an engineer, he experimented with his manometers at considerable depths in the sea near Cape Sipel, and found that the action on the envelope of glass is proportionate to the pressure. He has produced a mercurial manometer which indicates the pressure of thirty-four atmospheres. M. Lesseps of Suez Canal fame has recently been employed concerning an irrigating canal in connection with the Rhone.

M. Le Verrier has asked for an Administrative Commission to regulate the part which that useful institution, the Parisian Observatory, is to take in the Exhibition of 1878.

The following account of the means of preventing railway accidents is interesting. The Continental comment upon it is that the scheme is possible, though it remains to be seen if it can be applied. There should be placed before every locomotive a series of little waggons rolling upon the rails, and fastened together by shafts, which are as long as possible. The chariot ahead of the train will be furnished with one or two stoppers, acting upon a signal the moment they have sustained a shock. As soon as the signal works it will communicate to the engine, in which a second signal acts at once upon the lever. If two trains so equipped come into collision, the steam would make each of the two locomotives withdraw.

THE INVENTORS' INSTITUTE.

THE Members' Meeting of the Institute held on Thursday, the 25th of January, was one numerously attended. Sir Antonio Brady, the President, occupied the chair.

On the programme for the evening were two papers for discussion, one by Mr. E. J. Hough, "On a New Method of Raising Sunken Vessels from Deep Water," and the other by Mr. J. J. Nickoll, "On the Prevention of Collisions at Sea."

Mr. Nickoll read his paper first, which he began by calling attention to the great loss of life and property by ships' collisions, and said that the existing "rule of the road at sea" was comparatively useless, because of the difficulties which had been found in its practical operation. He pointed out that the one thing necessary to prevent collisions, especially at night in hazy weather, when two fast steamers are approaching each other at speeds from twenty to thirty miles an hour, is to ascertain at once, and with absolute certainty, which way the approaching ship is steering. At present this can only be done after the ship has answered her helm, and moved so far out of her course when the two are meeting, end on—as to obscure one of her side lights, and then the knowledge very often comes too late, and a disastrous collision is the result. In order to obviate the danger arising from this course, he proposed a code of signals for day and night use, which, by being connected with the helm, would at once indicate the way the vessel was steering. For day use this signal consists of a semaphore arm in the fore part of the ship, and for night a lantern, with revolving screen, one-third green glass, one-third red glass, and the remainder opaque, about 18-in. high, hoisted in some conspicuous part of the foremast. In the position of helm amidships nothing is seen of the semaphore, and no light is shown by the lantern at night; but as soon as the steersman moves the helm either to port or to starboard, the characteristic red for port, and green for starboard, is displayed in the shape of a red arm in the semaphore, and a red light from the lantern when the helm is ported, and of a green arm or a green light when the helm is put to starboard. A model was exhibited which clearly showed the working of the invention.

On the conclusion of the reading of this paper, Admiral Selwyn, as a practical sailor, said he thought the invention very valuable, and believed that by its adoption in the mercantile and naval marine, a great many collisions, and the loss of property arising therefrom, would be prevented.

After some remarks from other gentlemen in the same spirit, a cordial vote of thanks was passed to Mr. Nickoll for his paper.

Mr. F. W. Campin, the Secretary, then read Mr. Hough's paper on "The Raising of Sunken Vessels from Deep Water."

This Paper we give *in extenso* in another column.

Dr. Macgregor Croft pointed out that the great difficulty was how to deal with the sand which had silted into the vessel.

Admiral Selwyn did not believe the *Vanguard* could be raised at all, for she must now be nearly covered with sand. Then the deck itself was not strong enough to bear the pressure necessary to lift her. A French company had bought the ship for £3,000, but their divers after one short descent had refused to go down again, as the danger and depth were so great. He did not believe the vessel, even if it could be got up, was worth the expenditure the operation would cost.

Mr. Hough briefly replied, and admitted that if the sand had very much silted up round the ship and got inside her, nothing would lift her; but he did not believe that this was the case, and, notwithstanding all that had passed that evening, he still entertained hopes of success.

Mr. A. J. Murray stated that having had a good deal of experience in marine questions, he confessed himself unable to see that the difficulties in raising the *Vanguard* were so insuperable as had been represented. That it would be a matter of considerable trouble he fully admitted; but then, what was the vocation of the inventors but one of conquering difficulties, and even of effecting what some people considered *impossibilities?* He thought they would all agree with him that in its general character and details Mr. Hough's plan was a good one, and therefore he did not see why it should not be tried on the *Vanguard* with every hope of a successful result.

The President remarked that Mr. Hough's plan was no doubt a very good one for ordinary purposes, but the *Vanguard* was, he thought, beyond its power.

A vote of thanks was then passed to Mr. Hough, and a similar compliment having been paid to the Chairman, the proceedings terminated. Upon conclusion of the meeting the members were invited to inspect a model of Mr. Hough's life-boat, Mr. Calley's boat lowering apparatus, and other inventions.

HOUGH'S PLAN FOR RAISING SUNKEN VESSELS FROM DEEP WATER.

The Paper read by the Secretary of the Inventor's Institute for Mr. Hough, at the Meeting on the 25th ult., began by giving a detailed specification of the course to be adopted to raise a sunken vessel, which set forth the following particulars:—

All the openings in the vessel to be covered, and small engines of two cylinders, with centrifugal, double acting or spear pumps attached, placed on the upper or lower deck, or against any convenient opening in the side. These pumping engines to be driven by compressed air from the surface. Details.—Openings in sunken vessels, in ordinary cases, are effectually stopped by sails, oakum, or other such materials, but, on account of the depth of water and pressure; in this case, wooden or iron covers would be made, of sufficient strength, from the drawings of the vessel. These, covered at the edges with felt or such like materials, would render the vessel quite water-tight. Over difficult openings where flat covers could not be employed, conical iron ones, or deep cylindrical ones of iron would be used. The edges, where pressing against the vessel, to be made water-tight in the same manner as the flat covers, and the hole caused by collision, covered in the same manner as the others. The pressure of the water will keep them to while pumping, but to keep them in their places while preparing for lifting, and at the moment of raising to the surface, small fastenings would be arranged. Covers made of wood would be weighted: those made of iron supported by floats to the equilibrium of the water for the convenience of the diver in placing them. If any damage to bottom, damaged parts to be cut off by closing slides in bulkheads. Double cylinder engines, from 5 in. to 10 in. diameter, made very compact, with pumps to be connected. Number of engines and pumps controlled by deck arrangements. Compressed air from the surface to be supplied through flexible tubes or pipes. or both combined, as required. The exhaust air from the engines would come again to the surface through flexible tubes to relieve the pistons of the back pressure of the water. Wherever an opening in the deck is available, an engine and pump would be placed over it. If upper deck too high (say more than 20 ft. lift for the water) a large tube to be connected to the underneath side of the engine tablet, and the pump lowered and fixed to the bottom of the tube; the connection between engine and pump being preserved by a longer pump rod steadied by brackets in the sides of the tubes. If centrifugal pumps employed, the connection to the engine would be by vertical shafts or spindles. Or, if preferred, the engines and pumps could be placed on a lower deck, with the driving and exhaust tubes, also pump delivery pipes leading through the upper deck. This would dispense with the vertical tubes and shafts, but the engines could not be examined by divers while at work. In all cases when placed on the upper deck the tablet of the engines would form a water-tight covering to the opening it served. A tube would be connected to each pump and communicate with the interior of the vessel. This tube, brought to the surface, would bring the pressure of the atmosphere on the surface of the water within the vessel. This would be done as quick as possible, immediately from delivery-valve of pump when on the upper deck. Double-acting or centrifugal pumps according to position would be used. Surface arrangements for supplying the compressed air, &c., would be as follows: —A small handy steamer, fitted with not less than four air-pumps driven by suitable engines for compressing the air. All the driving, exhaust, and vent tubes, to be brought on board of this steamer. This must be done, as far as possible from the sunken ship, as she may launch a considerable distance when coming up. The direction of the launch is uncertain, but most likely in the direction of the tide, as the end that first rises would swing with the tide, and the ship will always launch in the direction of the highest end. All the tubes on board the steamer would have slip-joints to let go as the vessel rises. An air meter attached to each vent pipe would show the number of cubic feet of air passed into the wreck. This would represent the water pumped out and the progress of the work shown at any moment. Heavy fenders to be fitted to pumping steamer to enable her to go alongside and complete the pumping should there be any sea on. Spars to be fitted round the quarters and stern of the pumping steamer to keep ropes or the tubes out of the propeller. After lifting.—Sufficient towing power to be in readiness, with gangs of men ready to take charge directly the vessel comes to the surface. Also a steamer for steering, in case the steering gear is out of order. Recapitulation.—The whol-arrangement consists in stopping the openeings in the sunken vessel, and working pumping engines under water by compressed air.

Having thus fully explained the details of the plan he adopts, Mr. Hough proceeded to consider the question of raising the *Vanguard* in the following manner:—

CAN THE "VANGUARD" BE RAISED?

This question, Mr. Hough stated, can be best answered by first imagining a position from which she could be undoubtedly lifted, and then ascertaining in what her present position differs from it, and whether those differences present insuperable difficulties.

Had the *Vanguard* been sunk with no more than six feet of water on her decks with always smooth water, it is questionable whether ten days would have elapsed before she floated again. The usual plan in such cases would have been followed, viz., closing all ports, doors, hatchways, &c., by divers. The hole caused by collision, or any other opening not provided with covers, would have been roughly closed by sails, tarpaulin, oakum, &c. The pressure of the water forcing such covering materials closely into the openings while pumping. It would not be necessary that such covers should be made quite watertight, the power of the pumps considerably exceeding any possible leakage. Powerful pumps would be placed down any convenient opening, and a few hours would then be sufficient to lift the vessel. If none of the deck fittings stood above the surface of the water to receive the pumps a caisson of planks would be made and sunk over a convenient hatchway for the purpose.

From this supposed position there can be no doubt of success. If any doubt existed the fact that similar operations are being constantly performed would dispel it.

The next point to consider is, in what does the *Vanguard's* present position differ from this assumed one, and the difficulties arising from such differences? The differences in position are—increased depth of water, lying in a tideway and uncertainty of weather, creating the following difficulties:—

First.—A diver cannot work many minutes at one time (say not more than fifteen).

Second.—Co-operation between the diver and assistants on the surface difficult, rendering some operations impossible that could be easily effected at a less depth.

Third.—Increased pressure rendering such temporary covers as would suffice at a less depth useless, and also (perhaps) rendering some internal support to the ship necessary while pumping her out.

Fourth.—The impossibility of reaching the wreck by any ordinary arrangement of pumps.

Fifth.—The tide or weather disturbing operations, the latter destroying perhaps the labour of days where the lifting depends on the surface, arrangements being undisturbed as would be the case if an attempt was made to lift with chains.

These, to my mind, appear to be the principal (if not all the) difficulties arising from the difference of position at present, and that from which we know she could be raised, and if these difficulties can be met the vessel can be as surely raised from where she now lies as from any other sunken position. Taking the difficulties in rotation as before, the first is the time a diver can work.

First.—The work of the diver under my arrangement is confined to placing the covers on the openings; landing pumps on the deck of the wreck, and screwing on the flexible tubing and other light work connected therewith. None of these operations would require more than fifteen minutes at one time to complete, as will be shewn presently.

Second.—Co-operation between the diver and his assistants on the surface. This is reduced to a minimum, and would be almost confined to the lowering down of the covers, &c., the co-operation necessary to effect this would be very small, when an account of these covers, &c., is given this will be clearly seen.

Third.—Better covers required than at a less depth.

The plans of the vessel would enable one to make covers of the exact size and shape to fit any opening in the vessel. These, having soft material on their edges, would be quite watertight, without such close fitting as would render the placing of them difficult by the diver.

The covers intended for the vessel's sides would be made only a little heavier than the water to enable the diver to move them about a little by his own unaided strength. A cross-bar, catching on the inside of the post or other opening, with a thumb-screw coming through the cover, would be sufficient to hold it in its place until pumping commenced.

A cover to suit the hole caused by the collision would be made in a somewhat similar manner.

The covers over the opening in the decks, funnels, &c., would be made as heavy as possible, and simply lowered in their places, their weight being sufficient to secure them in their places until pumping commenced.

Of course directly this began the pressure of the water would not only retain all covers immovably in their places, but would effectually prevent them leaking by pressing the soft material on their edges against the surfaces around the openings.

In my plans the form of covers that would probably be required are such as will either cover flat parts or where a gun projects through a port, or for covering up the funnels or similar projecting parts. It will thus be seen that the placing of none of these covers would require the diver to remain under water more than fifteen minutes at one time.

I might also state that each operation being a short one would enable the diver to do all that was required at slack water. This of itself is an immense advantage.

The landing of the pumps on the deck and connecting the tubes (to be presently described) could also be done with the same ease and shortness of time as will be shewn presently.

Will the increased depth of water, by causing such a great pressure on the wreck, crush the deck in or strain them when the pumping commences, and remove the internal support of the water?

I do not think this would be the case, but no difficulty would be experienced on this account, as compressed air can be conveyed into the interior of the vessel to within a few pounds of the pressure of the water. This compressed air would be supplied through small flexible tubes, by pumps in a vessel on the surface. No difficulty would be experienced in confining this compressed air within the wreck, as its pressure would be kept below that of the water, and the difficulty of confining air within a wreck does not commence until its pressure exceeds that of the surrounding water.

Fourth.—the impossibility of reaching the wreck by any existing arrangements.

I meet this difficulty—as stated in my specification—by making small centrifugal or other pumps with two driving cylinders attached.

These pumps and engines are made the same as if driven by steam. The whole would be made as compact as possible on a tablet; the tablet made to suit such convenient opening in the wreck as may be decided on, and thus forming a cover for same. The whole would be lowered in its place the same as another cover. These pumping engines would be driven by compressed air conveyed to them from the surface. Another flexible tube would be attached to the exhaust and brought to the surface to relieve the pistons of the back pressure that would otherwise be produced by working against a column of water. A third pipe or flexible tube would be attached to the pump tablet and communicate with the interior of the vessel. This third tube being also brought to the surface, would convey air for vent into the ship while pumping. If compressed air for the support of the wreck was used, it would be conveyed through this tube. In either case, if required, a meter could be attached to the vent pipe to register the volume of air admitted to the vessel. This would represent the quantity of water pumped out, and shew the progress of the work. The number and size of the pumps required would depend on the number of convenient openings for placing them.

Fifth.—The last difficulty mentioned in the commencement of this paper was tide and weather.

I have previously shown that each operation is so short that it can be done at slack tide; and so far as the weather is concerned, everything that is done to the vessel will not be disturbed by the sea. A few hours would be sufficient, when all is ready, to attach the pipes to the engines and commence pumping.

In this paper I have not given a full description of the lifting arrangements, having done this in my specification and plans for raising sunken ships; my object in the foregoing remarks being to shew the suitability of my patent to the requirements of the *Vanguard*.

SCHOOL OF SILK WEAVING.

The Chamber of Commerce of Lyons, naturally proud of the exquisite fabrics of that city, and desirous that they should be still further improved, gave a sum of £2,000 recently for the establishment of a weaving section in the school of commerce of that city; and the other day the members paid a visit to the school to see what progress had been made. The section was only formed six months since, but it assumed considerable importance immediately. The weaving school is established in a special building of three stories; it possesses at present fourteen looms. On the upper floor are plain looms for satin, pekin, faille, and velvet, with a lecture-room, and cabinet for demonstrations. On the first floor, looms for fancy tissues, brilliantine, embroidery, damask, gauze, fancy velvets; Saint Etienne looms for ribbons; and a room for reading designs. On the ground floor are power-looms, by Diederiche and Sallier, a double-width plain velvet loom, both driven by a gas-engine of one horse power, which has the advantage of being started or stopped instantaneously. There are at present twenty-one pupils in the section, divided into two classes, and alternately working at the loom and studying the theory of the art. The pupils are also taught book-keeping, foreign languages, and mechanical drawing. A director and two workmen suffice for the practical work, and there are two professors for the theoretical. The establishment of such a school has often been pressed upon Lyons, but heretofore the authorities have hesitated to take the initiative; having done so, the success was immediate, and the act most popular. In the report on the subject occurs this paragraph, which well deserves careful consideration in all countries:—"In our days, the first thing necessary for the development of an industry is the raising of the instruction of those who are employed in it. Here is the secret of all success. Practice, traditions, usage, all require to be constantly revivified by the teachings of science."

BRAY'S IMPROVED CARRIAGE POLE HEADS.—This is a simple arrangement of the pole head for securely holding the pole straps. It is easily shifted for connecting and disconnecting, and will disconnect the strap self-actingly in case a horse falls down. The eye pieces for holding the straps are made in separate parts, and are attached to the pole by separate socket pieces, one of which is rigidly fixed on the pole, while the other is capable of turning for opening and closing the eyes. The two socket parts have cam projections, and are fixed with a spring, by which the eyes are kept closed, but which allow them to open, by a certain amount of pressure, to allow the straps to escape. The inventor of this arrangement is Mr. George Bray, jun., of Deptford.

THE SCIENTIFIC REVIEW
AND
Scientific and Literary Review
Is published at the
OFFICES, 21, COCKSPUR STREET, CHARING CROSS
LONDON, S.W.,
On the 1st of every Month, and sent post free on prepayment of the ANNUAL SUBSCRIPTION OF 6s. 6d.; or it may be had by order, from Messrs. KENT AND CO., PATERNOSTER ROW, or any Bookseller or Newsagent in the kingdom, *price* 6d. *per copy*.

THE INVENTOR'S INSTITUTE,

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE, LONDON.
ESTABLISHED 1ST MAY, 1862.

Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

SESSION 1876-77.
MEMBERS' MEETINGS AT 8.15 P.M.
THURSDAY, March 8th.—Patent Law Conference.
THURSDAY, March 22nd.—Exposition of Inventions.
Executive Council Meetings same days at half-past 7 p.m.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts. F. W. CAMPIN, Sec.

DEATH OF MARSHALL MASON HARRIS, ESQ.,

Member of the Council of the Inventors' Institute, and until recently Treasurer of the Institute.

It is with unfeigned regret we record the decease of this very worthy Member of the Institute, which took place at the time of our going to press last month.

At the last Meeting of the Executive Council, a vote of condolence with the father and mother was passed, which will be found set forth in the Proceedings of the Institute given below.

Proceedings of the Institute.

ON 22nd February the Executive Council met, Sir ANTONIO BRADY being in the chair.

The Secretary, Mr. F. W. CAMPIN, adverting to the lamentable loss the Institute had sustained by the decease of Mr. M. M. Harris, a Member of the Council, and, until recently, Treasurer of the Institute, moved the following resolution:—"That the Members of the Executive Council of the Inventors' Institute having learnt with great regret of the decease of Mr. Marshall Mason Harris, a Member of the General Council, and, until recently, Treasurer of the Institute, desire to present to his father and mother their condolence with them in their great loss. They know that although any sorrowful feeling of theirs must fall far short of that experienced by his parents, yet they can so far sympathize since they feel deep sorrow for the loss of a Member of the Institute who has ever been a zealous worker in its behalf, and who, moreover, endeared himself by his friendliness to all who had the pleasure of associating with him. And the Executive Council desire to present this resolution not only for them selves, but for the whole body of the Inventors' Institute.

This resolution being seconded by F. H. Varley, Esq., C.E., Ex-Council, I.I., was passed unanimously, and the Secretary was directed to forward a copy of same to the parents of Mr. Harris.

The Secretary then read a letter from the MASTER OF THE ROLLS (one of the Commissioners of Patents), who, in replying to a letter forwarding a copy of the resolution of the Executive Council, conveyed his opinion that "*a material reduction in the cost of patents should be made.*"

The Secretary reported that the Attorney General had presented to the House of Commons a new Patent Law Bill, synopsis with comments on which is given in another column.

ADMIRAL SELWYN then read a Draft Petition to Parliament, objecting to several points in the Bill (these being in general agreement with the remarks in the synopsis) This was unanimously approved of, but it was deemed the better course to refer the matter to a Special Committee to communicate with Mr. MUNDELLA, M.P., and take other action upon the Bill in accordance with the terms of the Petition. The names of the Committee:—The President, Admiral Selwyn; the Secretary, F. H. Varley, Esq.; also, Messrs. W. Smith and Mottershead.

MEMBERS' MEETINGS.—On Thursday, 8th February, at the Members' Meeting, the business was that of a Patent Law Conference; but after some general observations on the subject it was agreed that the Conference should be postponed till the next meeting of the Institute, to be held on the 22nd February.

On 22nd February, 1877, Sir Antonio Brady, President of the Institute, in the chair, the action of the Executive Council above mentioned, in regard to Petitioning on the subject of the New Patent Law Bill was approved of, and the meeting then passed to the paper of M. CAMILLE ESPIR, read by Captain Roberts, on a New Explosive Compound. **A full report as to which we are compelled to reserve for future notice.**

Monthly Notices.

The meeting of the Iron and Steel Institute will be held at the Institute of Civil Engineers, Great George-street, commencing March 20th, under the presidency of C. W. Siemens, Esq., LL.D. Mons. Gautier, of Paris, will read a paper on the subject of "Mild Steel," and several other papers on important subjects are promised.

Dyeing Light Rose.—For 22 lbs. fabric, use 10½ ozs. oxalic acid, 5¼ ozs. tin crystals, ¾ oz. cochineal. Boil, cool, enter and dye at a boil. Both dark and light rose shades are much better produced with eosine. For dyeing chamois on flannel, dye as for light rose, and add for 22 lbs. fabric, from ⅓ to ¾ oz. flavin, according to shade.

Asphalte Tiles.—At the Bavarian Industrial Museum there has recently been exhibited a new kind of flooring tiles made from asphalte, in a very simple way. The drawing of the intended design is first made on coarse heavy paper. Then it is covered with bits of china and glass, so as to from a mosaic. Lastly, a border is made to the sheet, and liquid asphalte is poured upon it. After the whole has been covered, the paper is taken away with cold water, and the tile is finished. This flooring is said to be handsome in appearance, and to resist damp for an indefinite period of time.

Technical Education.—A meeting of the City Companies interested in this subject was recently held at Drapers' Hall. For some years past several individual Companies of this class have made efforts for the promotion of technical education, but it has been lately felt that if the subject is to be treated on a scale adequate to national requirements, a combined effort is necessary. The course suggested is to establish a central technical University, with affiliated schools of instruction in connexion with the various industries carried on in the suburbs of London and the manufacturing districts of the United Kingdom. Already support to the extent of several thousands a year has been promised to the movement.

Death of Capt. J. E. Davis, R.N.—This gallant seaman was well known as an authority on Arctic matters. He was "Master" in the *Terror* in the Antarctic Expedition, under Sir James Ross, 1839-1843. He was a capital draughtsman as well as a scientific seaman, and rendered most valuable services in the Hydrographic Department of the Admiralty. He had much to do with the experiments made for the improvement of deep-sea sounding, preparatory to the equipment of the *Challenger*. Capt. Davis retired but a few months ago from the Hydrographic Department; but his decease was quite unexpected. He was only sixty-one, and had been forty-five years in the service.

Mr. G. L. Basset has built at Camborne, in Cornwall, a laboratory, and fitted it up with all necessary conveniences for assaying, or for the chemical analysis of ores. He has handed this building over to the Miners' Association of Cornwall, for the use of the teachers and of any of the members of the classes. Beyond this, any miners desirous of making investigations can do so by obtaining permission. Since every improvement in the preparation of mineral ores for the market depends upon the practical applications of science, this gift from Mr. Basset is of the highest value, and his action is one worthy of being followed in other mining districts.

The Associated Chambers of Commerce on the Patent Laws.—At the annual three-day Session of the Associated Chambers of Commerce, under the presidency of Mr. Sampson Lloyd, which was brought to a conclusion on 22nd February, after considering various points as to Factory Acts, Partnership Law, the objections to Income Tax as levied on trades and professions, the following resolutions as to the Patent Law were agreed to, viz.:—"1. That in consequence of the great difficulty there is in obtaining an exact knowledge of the contents of the patents under the 'old law' (1617 to 1852), by reason of the imperfect indexes, it is of great importance that a complete and extended subject-matter index be made with as little delay as possible on the plan adopted in the indexes for the year 1874 and 1875. 2. That the series of classified abridgments requires revising and bringing down to the present date, and that arrangements should be made for the same being regularly continued so as to be complete up to the end of every three months. 3. That the publication of abridgments of the current patents in chronological order should be resumed, the abridgment in each case being prepared by competent persons employed by the office, instead of, as heretofore, being furnished by the applicants themselves. 4. That in order to facilitate searches for patents the annual indexes of names, from 1852 downwards, should be consolidated into a single series."

SYNOPSIS OF NEW PATENT BILL.

WITH SUGGESTIONS BY MR. F. W. CAMPIN.

Again we are compelled to give the most prominent position in this journal to the Patent Law question, by placing the above-mentioned Synopsis and suggestions before our readers.

Sec. 1 to 4.—1. Short Title. 2. Commencement of Act (fixed as December 31st, 1877). 3. Repeal of former enactments in schedule. 4. Interpretation Clause.

Sec. 5. Commissioners of Patents to be the present Commissioners, and five other persons to be appointed as specified in Bill.

Sec. 6. Examiners (two) and Assistant Examiners (two or four).

Sec. 7. Filing of application and provincial specification.

Sec. 8. Provisional Protection (twelve months allowed).

Sec. 9. On the filing of the application, the Commissioners shall refer the case to an Examiner.

The Examiner shall report to the Commissioners his opinion :

1. Whether the invention is a proper subject for a patent within the statute of monopolies.
2. Whether the title of the invention and the provisional specification are properly framed and sufficient.

The report of the Examiners shall be open to the applicant, but shall not be made public by the Commissioners.

Sec. 10. Not less than *three months* before the end of the period of provisional protection, the applicant may file at the Patent Office a further specification, particularly describing and ascertaining the nature of the invention, and in what manner the same is to be performed (in this Act referred to as the complete specification). If he fails to do so, he shall be deemed to have abandoned the application, and it shall not be further proceeded on, and the provisional protection shall thereupon cease.

Sec. 11. On the filing of the complete specification the Commissioners shall make* public the application, and the documents relating thereto, including the provisional specification, the report of the Examiner thereon, and the complete specification.

Sec. 12. On the publication of the complete specification, the Commissioners shall refer the case to an Examiner. The Examiner shall report to the Commissioners his opinion whether the complete specification is in conformity with the provisional specification, and is properly framed and sufficient. If, on the Examiner considering the case for the purpose of so reporting thereon, it appears to him, having regard to former specifications and other documents in the Patent Office, and to publications known to him, that the invention is open to objection on the ground of want of novelty, he shall report to the Commissioners accordingly. The Commissioners shall then make* public the report of the examiner.

Secs. 13 and 14 should be read together.

Sec. 13. After that report of the Examiner, the Commissioners shall refer the case to the Law Officer. The Law Officer shall, if required, hear the applicant, and any person entitled in the opinion of the Law Officer to be heard in opposition to the grant. The Law Officer shall report to the Commissioners his opinion whether a patent may be allowed for the invention or not. The Commissioners shall then make public the report of the Law Officer.

Sec. 14. After the report of the Law Officer, the applicant may within the prescribed time give notice at the Patent Office of his intention to further proceed with his application. If he does not so give notice, he shall be deemed to have abandoned the application, and it shall not be further proceeded on, and the provisional protection shall thereupon cease.

Secs. 15, 16, 17, 18, and 19 relate to the routine as to sealing the patent, and opposition thereto (by 16), if the Law Officer reports against grant of patent, applicant may petition Lord Chancellor to seal same.

Sec. 20. The term limited in every patent for the duration thereof shall (notwithstanding anything in the Statute of Monopolies) be *twenty-one* years from its date. But every patent shall, notwithstanding anything therein, or in this Act contained, cease at the end of the third, or seventh, and twelfth complete year of that term, unless the patentee takes out at the Patent Office a certificate of renewal, which shall be granted on his request in writing. If, nevertheless, in any case, by accident, mistake, or inadvertence the patentee fails so to take out a certificate of renewal, he may apply by petition to the Lord Chancellor for an enlargement of the time for taking out the same. Thereupon, the Lord Chancellor may, if he thinks fit, enlarge the time

No objections to offer.

5. It is absurd to have two grades of Examiners, when the work of the Examiner has to be controlled by the Law Officer, and the number is totally inadequate. There are more than *one hundred Examiners* in the United States Patent Office. Perhaps, as a great deal of the examination must be a mechanical kind of work, five Examiners (1. civil, military, and naval engineering; 2. mechanical engineering; 3. chemistry; 4. electricity; 5. miscellaneous) with a large staff of examiners' clerks might do. Moreover, there are many persons who object to examination *in toto*.

8. Good.

9. The reference and examination at this stage is objectionable because an invention being in an inchoate state any decision as to it will be likely to be erroneous. Moreover, it does not appear from the Bill what is to be the result of this examination. The previous clauses (7 and 8) give provisional protection, therefore this examination seems to *come after* such protection has been obtained; hence of no use. An examination for ensuring the deposit of intelligible documents is all that is requisite, seeing a *second examination* is provided for when every point can be fully entered into.

10. It ought to be open to anyone to dispense with the provisional specification and make an application with a complete specification as now, and get full right of a complete patent at once.

11. *This should be altered by introducing the words "render accessible to the" instead of "make."

It is objectionable to let all the world know all objections that have been made to a man's patent. It will be sufficient that everyone interested can get to see the documents.

12. Instead of the words "on the publication of" this should read "on opening to the public."

* The word "make" should as in clause 11, be altered to "render accessible to the public." This alteration being proposed for the reasons given as to clause 11.

13. There is no reason why there should be any reference to the Law Officer, when Examiners report in favour of grant and there is no opposition; it is only giving unnecessary trouble. The Law Officer is confessedly not so capable of judging as to novelty as an "Expert" Examiner.

14. As this notice to proceed comes after the examination it seems a useless formality, especially as a Request, for sealing is also required before the patent can be completed.

20. The extension of patents to 21 years is good. But, the third and seventh years come too quickly to enable an inventor to meet these payments.

Either annual payments, or the postponing of these payments to fifth, ninth, and thirteenth years is required.

accordingly, on such terms (if any) as to him may seem just, subject to the following restrictions and conditions:—

1. The time for taking out such a certificate shall not in any case be enlarged so as to extend beyond *three months* from the expiration of the third, or seventh, or twelfth year aforesaid (as the case may be).
2. No proceeding shall be taken in respect of an infringement committed within the enlarged time, unless leave to take such proceeding is made part of the order for enlargement.

Sec. 21. The patent to bind the Crown, but the terms to be paid to be settled by the Treasury.

Sec. 22. A patent shall be liable at any time after the expiration of *three* years after its date, to be revoked on either of the following grounds:—

1. That the patentee fails to use or put in practice the invention by himself or his licenses, to a reasonable extent within the United Kingdom, or to make reasonable efforts to secure the use or practice thereof, the proof of the contrary whereof shall lie on him.
2. That it is made to appear to the Lord Chancellor that in order to ensure a proper supply to the public of articles produced under the patent, or proper means for the use of the invention by the public, licences are necessary, and the patentee fails to grant licenses to proper persons requesting the same on terms which the Lord Chancellor, having regard to all the circumstances of the case, deems reasonable.

Sec. 23. Foreign and colonial inventions.

Sec. 24. An applicant or patentee may amend by way of explanation supplement or otherwise.

Sec. 25. Revocation of patent by Lord Chancellor, substituted for proceeding to repeal patent by *scire facias.*

Secs. 26, 27, 28. Assignments and licenses, and registrations thereof.

Sec. 29. Provisions for special protection of inventions at international, industrial, and other exhibitions. These are similar to the law now in force.

Sec. 30. Use of patented inventions allowed in foreign vessels in British waters—similar to law as now existing.

Sec. 31. A patent granted to true and first inventor, not to be affected by another previously patent granted in fraud of him.

Sec. 32. Falsification of entries made a misdemeanour.

Sec. 33. Unauthorised use of the name or mark of patentee rendered subject to a penalty of fifty pounds.

Sec. 34. Making a false declaration under this Act declared a misdemeanour.

Secs. 35 to 47. Enactments as to procedure, which apparently do not call for objection.

Secs. 48 to 53.—Seal of Commissioners, and power to make rules.

The following rule, as it seems to give power to the Commissioners to require the deposit of models, is objected to—namely:—

For preventing and regulating the deposit of drawings, and copies thereof, and copies of specifications, and of models in such cases as the Commissioners may think fit.

Secs. 54 and 55. Companies to make annual report to Parliament, and the quorum of companies to be three or more, but Lord Chancellor or Master of Rolls to concur in appointments or renewals of offices in making of general rules and in the annual report.

Secs. 56. Stamp Duty to be as in schedule.

Secs. 57 to 61. Provisions as to legal proceedings, &c., in Scotland and Ireland.

Secs. 62 and 63. Transitory provisions.

Sec. 64. The provisions of this Act, relating to certificates of renewal at the end of the third and the seventh, but not of the twelfth complete year of the term for which a patent is granted, and to the enlargement of time for taking out those certificates shall extend and apply to patents existing at the commencement of this Act, and to patents to be granted on application made before the commencement of this Act, notwithstanding anything in such patent or in this Act, or in any enactment repealed by this Act.

Sec. 66. All the Lord Chancellor's present powers are saved and reserved.

Sec. 67. It shall be lawful for Her Majesty the Queen, her heirs, or successors, by warrant under the royal sign manual—

(1.) To direct any specification to be cancelled before the sealing of the patent, and thereupon the provisional protection shall cease.

(2.) To direct the Commissioners to withhold their warrant for the sealing of a patent.

(3.) To direct that a patent for the issuing whereof a warrant has been sealed, shall not issue.

(4.) To direct the insertion in any patent of any restrictions, conditions, or provisoes, in addition to, or in substitution for, any restrictions, conditions, or provisoes, that would otherwise be inserted therein.

No objection to offer.

21. The Treasury is not sufficiently disinterested to be made the arbitrator in these cases.

22. If compulsory licenses are to be allowed, this should be expunged, for all the public benefit that can be justly pressed for can be obtained by the compulsory license system; and the non-user of a patent is generally no fault of the inventor's.

It is no use making a Patent Law which gives with one hand and snatches away with the other. There are so many arguments against both branches—1 and 2 of this clause—that it had better be expunged altogether, and to meet the mischief it aims at meeting, let it be.

Provided that if a patentee brings an action for infringement, and it can be proved that he has unreasonably abstained from using or putting in practice his invention, or has been unreasonable in respect to granting of licenses (proper questions to go to a jury) the same shall be a bar to an action for infringement.

23. It seems objectionable to place Colonial inventors on same footing as foreign inventors.

24. Not objected to.

25. No objection, except that there ought to be appeal to House of Lords allowed.

26 to 28. These provisions are mainly similar to those in Act of 1852, and no particular objection has been urged against them.

These clauses are similar in effect to the present law, and seem to be unobjectionable.

35 to 47. County Courts within the limits of their jurisdiction, should have full powers to deal with patent cases.

48 to 53. These powers are perhaps too large.

Under this Rule the Commissioners might compel every inventor to deposit a model, which would in some cases be very onerous, one hundred pounds is often paid for a good model.

Other clauses, no objection to offer.

All the benefits of this Act as far as applicable to patents granted under the old law, should be allowed to patentees who apply to be placed under the Acts.

Schedule of Fees:—

	£	s.
Up to Sealing of Patent	12	10
At end of three years	50	0
At end of seven years	100	0
At end of twelve years	100	0
Orders for Enlargement of Time of Payment:—		
At third year	5	0
At seventh year	10	0
At twelfth year	10	0
On Amendments:—		
Before Patent	5	0
By way of Supplement after Patent	10	0
In any other case after Patent......	10	0

Other duties are similar to Act of 1852.

Proceedings of Societies.

ROYAL SOCIETY.

FEBRUARY 1ST.—Dr. Hooker, President, in the chair.—The following papers were read: "On the Mean Directions and Distribution of the Lines of equal Barometric Pressure, and their Relations to the Mean Direction and Force of the Wind over the British Isles," by Mr. J. A. Broun,—and "On the Meteorology of the Bombay Presidency," by Mr. C. Chambers.

January 25th.—Dr. Hooker, President, in the chair.—The following papers were read: "Description of the Living and Extinct Land Tortoises. Parts III. and IV. The Tortoises of the Aldabra Group, and the Mascarenes," by Dr. Günther,—and "On Certain Definite Integrals," by Mr. W. H. L. Russell.

February 8th.—Dr. Guy, V.P., in the chair.—The following papers were read: "On the Hindoo Division of the Octave, with some Additions to the Theory of Systems of the Higher Orders," by Mr. R. H. M. Bosanquet,—"On the Transport of Solid and Liquid Particles in Sewer Gases," by Dr. Frankland,—and "Researches in Spectrum Analysis in connexion with the Spectrum of the Sun, No. V.," by Mr. J. N. Locker.

ROYAL INSTITUTION.

FEBRUARY 5TH.—Sir F. Elliot, V.P., in the chair.—Sir. T. D. Forsyth and Miss F. M. Gladstone were elected Members.

GEOLOGICAL SOCIETY.

JANUARY 24TH.—Prof. P. M. Duncan, President, in the chair.—Messrs. G. Barrow, W. H. Lindley, and J. S. Martin were elected Fellows.—The following communications were read: "Note on the Question of the Glacial or Volcanic Origin of the Talchir Boulder-Bed of India and the Karoo Boulder-Bed of South Africa," by Mr. H. F. Blanford,—"On British Cretaceous Patelloid Gasteropoda," by Mr. J. S. Gardner,—and "Observations on Remains of the Mammoth and other Mammals from Northern Spain," by Mr. A. L. Adams.

GEOGRAPHICAL SOCIETY.

FEBRUARY 12TH.—Sir R. Alcock, President, in the chair.—The following gentlemen were elected Fellows: Dr. Boyd, Rev. G. Brown, Messrs. E. A. Brown, C. Napoléon de Cardi, J. F. Corscaden, J. Findlay, R. Frewen, W. Green, A. Grey, H. C. Robarts, E. P. Vacher. "Introductory Lecture on Scientific Geography," by Lieut.-General R. Strachey.

SOCIETY OF ARTS.

JANUARY 31ST.—Dr. B. W. Richardson in the chair.—Ten new Members were proposed for election. The paper read was, "On the Ventilation of Rooms," by Mr. F. E. Thicke.

February 2nd.—Lieut.-Col. Yule in the chair.—The paper read was "On Indian Tea," by Mr. A. Burrell.

February 7th.—E. Woods, Esq., in the chair. Sixteen new Members were proposed for election. The paper read was "On Street Tramways," by Capt. D. Galton. The paper dealt with the various methods of applying mechanical power in place of horse traction for tramcars, and concluded by recommending the adoption of steam as the only practicable source of motive power.

February 8th.—E. Hart, Esq., in the chair.—The paper read was "On some Processes of Nature's Hygiene (Improvements in the production of Antiseptics, Disinfectants, and Blood Albumen)," by Mr. C. T. Kingzett. The new disinfectant proposed was a mixture of peroxide of hydrogen and camphoric acid, and is made by oxidising turpentine by blowing air through it.

February 13th.—Capt. Toyube in the chair.—The paper read was "On the Lake Systems of Central Africa," by Dr. Mann.

February 14th.—G. Godwin, Esq., in the chair.—Fourteen new Members were proposed for election.—The papers read were "On Zinc White as Paint" and "On the Treatment of Iron to prevent Corrosion," by Prof. Barff.

LINNEAN SOCIETY.

JANUARY 18TH.—Prof. Allman, President, in the chair.—The following gentlemen were elected Fellows: Dr. W. M. Ord, Messrs. T. Routledge and S. D. Titmas. A memento of the Polaris Expedition was exhibited by Mr. R. I. Lynch. This consisted of a pot of growing wheat, which had been sown and raised from the grain left in Polaris Bay, 81° 38′ N., by the American Expedition. Capt. (Sir G.) Nares, in a letter to Dr. Hooker, states that the grain had been exposed to the winters' frost, 1872-6; but, notwithstanding the intense cold it had been subjected to, the above sample, grown at Kew, gave 64 per cent. as capable of germination. A grain of maize among the wheat, which also sprouted, possessed even greater interest, inasmuch as being a truly tropical plant. The amphibious and migratory fishes of India formed the subject of a paper by Dr. F. Day. He first instanced many forms which respire air direct, can live for long periods after their removal from water, and are but little affected by a bandage being placed round their gills, preventing the use of these organs. He alluded again to those fishes that bury themselves in the mud; to the so-called showers of fish, some of which have descended putrid; and other singular phenomena. As regards structural peculiarities, the Saccobranchus was shown to have a distinctly amphibious circulation, venous blood being sent by the pulmonary artery to the respiratory sac, and arterial blood being returned from it to the aorta. Dr. Day questioned the accuracy of the swim-bladder of fishes being the homologue of the respiratory bladder of amphibia, and observed that in the Saccobranchus both a respiratory sac and a swim-bladder coexisted—the one along the muscles of the back, the other more or less enclosed in bone, but possessing a pneumatic duct. Mr. G. J. Romanes read a second notice "On Varieties and Monstrous Forms of Medusæ." He expressed surprise that among the jellyfish, at least the naked-eyed group, with their lowly grade of organization and proneness to exhibit the phenomena of gemmation, examples of monstrous and misshapen forms are comparatively rare. In those cases met with by him, especially in the common *Aurelia aurita*, the deviations from the normal type nearly always occur in a multiplication or suppression (*i.e.*, abortion) of entire segments. This affects the segments of the umbrella in a remarkably symmetrical manner, whilst the ovaries and manubrium, to a certain extent, may, or may not, be implicated.

CHEMICAL SOCIETY.

FEBRUARY 1ST.—Prof. Abel, President, in the chair.—Dr. H. E. Armstrong read a paper "On Kekuli's and Sadenburg's Benzene Symbols," in which he discussed the relative value of the two symbols as a means of expressing the known reactions of benzene and its derivatives, especially pointing out how Sadenburg's prime symbol was more in accordance with our knowledge of the quinones; but that up to the present time, although it might be considered proved that in benzene six carbon atoms were linked together in a closed chain, we had no evidence to show the manner in which the atoms were counted. Mr. W. H. Perkins read a paper "On the Formation of Coumarin and of Cinnamic and of other analogous Acids from the Aromatic Aldehydes." These acids, of which twenty are described in the paper, were obtained by the action of a metallic salt and acid anhydride, such as sodic acetate and acetic anhydride, on an aromatic aldehyde. The latter part of the paper contained an account of the acids obtained from coumarin.

INSTITUTION OF CIVIL ENGINEERS.

JANUARY 30TH.—Mr. G. R. S. Stephenson, President, in the chair.—The paper read was "On the Combustion of Refuse Vegetable Substances for Raising Steam," by Mr. J. Head.

February 6th.—Mr. G. R. Stephenson, President, in the chair.—His Majesty the King of Portugal was elected an honorary Member. Forty-five candidates were elected, of whom six were members, viz.: Messrs. B. H. Blyth, R. R. Burnett, W. R. Cole, J. C. Park, J. Reid, and W. F. Wightman; and thirty-nine Associates, viz.: A. W. Ackermann, T. C. J. Bain, H. O. Baldry, C. E. Botley, W. J. Boys, Capt. S. T. Bridgford, H. E. P. Cottrell, J. B. Crawfurd, H. Darwin, H. Davey, J. G. Dees, G. G. Dick, H. G. Dunlop, G. T. Fenwick, W. G. Fitzgerald, E. R. Gabbett, A. Hardwicke, H. J. Harman, J. Hart, F. W. Heinke, H. F. Joel, W. J. Jones, G. M'Lellan, W. B. Marshall, T. Mason, T. Matthews, A. S. Nice, C. A. B. Nyströmer, G. W. Randolph, W. Rogers, P. W. St. George, E. B. Smith, R. H. Swindlehurst, R. de Uhagon, I. J. Whitty, J. W. Wilson, jun., W. Wiseman, A. P. Wright, and S. Young. The paper read was "On the Sewage Question," by Mr. C. N. Bazalgettee.

ASTRONOMICAL SOCIETY.

FEBRUARY 9TH.—Annual Meeting.—W. Huggins, Esq., President, in the chair.—The following gentlemen were elected Fellows: Messrs. A. M. Worthington, J. S. White, and G. F. Hardy. The Annual Report showed that the number of Fellows had been increased during the past year, and that the Society's library had been enriched by several important presents of books and manuscripts. The minor planets have been discovered in the course of last year—six of them in America and four in France. In solar physics, Prof. Tacchini has made an interesting investigation as to the relative height of solar prominences at different times of the sun-spot period. Prof. Young has determined the rate of the solar rotation by means of the displacement of the dark lines in the spectrum of the sun's limb. He has also proved that the 1474 line is double, and that the two components are of unequal strength; the coronal line corresponds to the stronger of the two, whilst the other is one of the faint lines in the spectrum of iron. Mr. Huggins's photographs of the spectra of stars were also referred to. And a short account was given of the observations of the new star in Cygnus, which was discovered by Dr. Schmidt at Athens on the 24th of November last. Its spectrum gives several bright lines, amongst which are three of the hydrogen lines, C being the brightest of all, the sodium line D, or the chromosphere line near D; the magnesium lines *b*, and the coronal line 1474. The reduction of the observations of the Transit of Venus has been proceeding continuously at the Greenwich Observatory under the direction of Capt. Tupman. All the observations with transit instruments at the various stations for local time and longitudes are completely reduced, and the longitudes of Honolulu and Rodrigues by the observations of the moon in zenith distance have been completely reduced. An idea of the magnitude of the undertaking may be formed when it is stated that these two last calculations required the use of three millions of figures. The Report having been adopted, the Society proceeded to the election of officers for the ensuing year, and the following gentlemen were elected: President, W. Huggins; Vice-Presidents, J. C. Adams, Sir G. B. Airy, A. Cayley, and E. Dunkin; Treasurer, S. C. Whitbread; Secretaries, A. C. Ranyard and J. W. L. Glaisher; Foreign Secretary, Lord Lindsay; Council, J. Brett, W.

H. M. Christie, Warren De La Rue, J. R. Hind, E. B. Knobel, G. Knott, W. Lassell, E. Neison, Capt. W. Noble, Rev. S. J. Perry, Earl of Rosse, and Capt. G. L. Tupman.

ZOOLOGICAL SOCIETY.

February 6th.—O. Salvin, Esq., in the chair.—The Secretary read a Report on the additions made to the menagerie during January. Mr. Sclater exhibited and made remarks on some unnoticed characters in the original and unique specimen of Comrie's Manucode (*Manucodia Comrii*, P.Z.S., 1876, p. 459). Mr. H. Saunders exhibited a specimen of the Panay Sooty Tern (*Sterna anœstheta*), obtained on the English Coast, and the first recorded occurrence of this bird in the British Islands. Papers were read: by Dr. A. Günther, "On the Tortoises collected by Commander Cookson, R.N., during the visit of H.M.S. Peterel to the Galapagos Islands;" the main results of Commander Cookson's visit consisted in giving us a knowledge of the Tortoise of Abingdon Island (*Testudo Obingdoni*), and of the Tortoise of the north of Abemarle Island (*T. microphyes*),—from Mr. R. Collett, "On *Phylloscopus borealis*, as met with on the coast of the Varanger Fjord, and adjacent parts of Finmark,"—by Mr. Sclather, "On an apparently new Species of Spur-winged Goose of the Genus Plectropterus, proposed to be called *P. niger*," founded on two examples living in the Society's Gardens, which had been presented to the Society by Lieut. General A. V. Cunningham,—by Prof. A. H. Garrod, "On the Mechanism of the Intervertebral Substance, and on some Effects resulting from the Erect Position of Man,"—from Sir V. Brooke, "On the small Rusine Deer of the Philippine Islands," and giving the description of a new species proposed to be called *Cervus nigricans*, of which a female example was recently living in the Society's Gardens,—by Mr. O. Salvin and Mr. D. Godman, "On Twelve new Species and a new Genus of Butterflies from Central America," by Dr. Günther, "On the Zoological Collection made during the visit of H.M.S. Peterel to the Galapagos Islands," which had been worked out by himself and his assistants in the Zoological Department of the British Museum,—and by Mr. R. B. Sharpe, "On a new Species of Pheasant of the Genus Lobiophasis, and of a new Species of Pitta from the Lawas River, N.W. Borneo:" Mr. Sharpe proposed to call the former *L. castaneicaudatus*, and the Pitta, *Pitta Ussheri*.

SOCIETY OF ANTIQUARIES.

February 8th.—F. Ouvry, Esq., President, in the chair.—Mr. J. H. Cook exhibited several objects. Amongst them, a specimen of a most curious key to a cryptograph, or secret cipher. This would appear to have been used about the year 1660, as may be inferred from the names mentioned in the key. The cipher varied according to the day of the month, so that, according to the date inserted in the letter (which was not necessarily the true date), a different key had to be used. The key may be thus described:—On a sheet of paper were drawn four concentric circles; each of these was divided by radii issuing from the common centre, and making in all seventy-two spaces. In each space is a word. The two inner circles are drawn on a movable disc attached to, but moving freely round, the centre, so as to be capable of any necessary adjustment in relation to the two outer circles. Just under the edge of this movable disc, the numbers of the days of a month occupy thirty-one of the radiating spaces, and are repeated backwards on the opposite side of the circle. The movable disc was then adjusted according to the cipher system which the writer designed to use. On the back of the sheet of paper were fifteen rules for the use of the cryptograph. From the nature of the words introduced, the correspondence would appear to have been chiefly on matters of ecclesiastical controversy.

PHILOLOGICAL SOCIETY.

February 2nd.—Dr. J. A. H. Murray in the chair.—The paper read was by Mr. H. Sweet, President, "On Parallel Developments in English and the Modern Scandinavian Languages." Two kinds of agreement between cognate languages were pointed out: 1, negative, or traditional, the result of the retention of a common form; and 2, positive, or parallel developments, which take place independently in each language, in obedience to natural laws. The importance of the latter class for the determination of the general laws of language was illustrated by many examples from the languages treated of.

MICROSCOPICAL SOCIETY.

February 7th.—Anniversary Meeting.—Mr. H. C. Sorby, President, in the chair.—Two new Fellows were elected. The Annual Report of the Council showed the society to be in a satisfactory and prosperous condition. The President delivered the annual address, in which, after reference to the memory of those of their number deceased during the past year, he gave an interesting account of his recent researches into the composition and origin of the loose materials which form the sands and clays of this country, and also of those composing the sandstones and stratified rocks. The result of the ballot for Officers and Council for the ensuing year was an follows: President, Mr. H. C. Sorby; Vice-Presidents, Dr. L. S. Beale, Sir J. Lubbock, Rev. W. H. Dallinger, and Mr. H. Powell; Treasurer, Mr. J. W. Stephenson; Hon. Secretaries, Mr. H. J. Slack and Mr. C. Stewart; Council, Dr. Braithwaite, Dr. Lawson, Messrs. Bevington, Brooke, Crisp, Ingpen, Jones, Loy, McIntire, Millar, Palmer, and Ward; Assistant Secretary, Mr. W. W. Reeves.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

February 6th.—Dr. S. Birch, President, in the Chair.—The following papers were read: "On the Cypriote Inscriptions," by Mr. H. Fox Talbot," and "On a Himyaritic Seal found in the Hauran," by Dr. I. H. Hall.

PSYCHOLOGICAL SOCIETY.

February 1st.—Mr. Serjeant Cox, President, in the chair.—Messrs. T. Moseley, E. B. Smith, and H. C. Emery were elected Members. Some communications of psychological phenomena were read. Mr. Serjeant Cox read a paper "On some Phenomena of Sleep and Dream," showing that many of them may be traced to the action of the double brain, and the partial slumber of either hemisphere. A discussion followed, which was adjoured.

PHYSICAL SOCIETY.

February 3rd.—Prof. G. C. Foster, President, in the chair. Mr. J. N. Lockyer was elected a Member. Prof. O. Reynolds exhibited a number of experiments in relation to vortex-motion in fluids. The *Annual General Meeting* was then held. The President read the Report of the Council, of which the following is a brief abstract:—The Council points with satisfaction to the number and interest of the papers read before the Society, and a brief summary is given of the more important. The Society has to regret the loss of three of its members, Messrs. D. Forbes, A. S. Hobson, and A. Pinn. The publication of a new edition of Prof. Everett's work, and of a complete edition of Sir C. Wheatstone's writings, is announced; and the Council hopes shortly to undertake the translation of scientific papers from foreign sources to be published in its *Proceedings*. The following Officers and Council were elected for the ensuing year: *President*, Prof. G. C. Foster, ; *Vice-Presidents*, Profs. W. G. Adams and Gladstone, W. Spottiswoode, Sir W. Thomson, and Dr. W. H. Stone; *Secretaries*, Prof. A. W. Reinold and W. C. Roberts; *Treasurer*, Dr. E. Atkinson; *Demonstrator*, Prof. F. Gutherie; *Other Members of Council*, Prof. W. F. Barrett, L. Clark, Major Festing, W. Huggins, Prof. Kenedy, O. J. Lodge, Prof. Macleod, Prof. B. Stewart, Prof. Unwin, and E. O. W. Whitehouse.

MATHEMATICAL SOCIETY.

February 8th.—C. W. Merrifield, Esq., V.P., in the chair.—Mr. G. W. von Tunzelmann was admitted into the Society.—The following communications were made: "On the Area of the Quadrangle formed by the Four Points of Intersection of Two Conics," by Mr. Leudersdorf,—"A Certain Series," by Mr. J. W. L. Glaisher,—"The Differential Equation $\frac{dx}{\sqrt{X}} + \frac{dy}{\sqrt{Y}} = o$," by Prof. Cayley,—and "On the Classification of Loci" and "A Theorem in Residuation," by Prof. Clifford.

CAMBRIDGE PHILOLOGICAL SOCIETY.

February 8th.—Rev. Prof. Kennedy, President, in the chair.—A paper, by Dr. Hager, was read, upon the treatment of the bodies of criminals at Athens, in which he stated his belief that in very early times criminals were thrown down into the *barathrum* alive,—afterwards sentence of death was carried out in prison, and the corpses were thrown into the pit,—until at last they were allowed to be buried, but not within the boundaries of Attica, with the exception of those cases when the bodies were restored to the relatives to be buried in Attic soil.—A paper, by Mr. Parley, was read, "On Aesch, Choephorae, lines 472-3."—Mr. Skeat noticed numerous resemblances between English and Sanskrit.

HISTORICAL SOCIETY.

February 8th.—Dr. Zerffi in the chair.—Papers were read by Mr. S. Robjohns, "On Buckland Abbey and Sir Francis Drake," and by Mr. G. L. Gomme, "On Sovereignty in Relation to the Origin of Social Institutions." In the course of a discussion, the Chairman gave an address on the formation of Communities and States.

ROYAL SOCIETY OF LITERATURE.

January 24th.—C. Clark, Esq., in the chair.—A paper was read by Mr. C. H. E. Carmichael, "On Dante and the Thirteenth Century." Mr. Carmichael argued against the ordinary chronological arrangement of Dante's position, by which he is classed with Petrarch and Boccaccio as a writer of the *fourteenth* century, contending that Dante's spirit is really of the thirteenth century, which ought to be considered as the true zenith of the Middle Ages.

STATISTICAL SOCIETY.

January 30th.—J. Heywood, Esq., President, in the chair.—The paper read was "On the Recent Economic Progress of New Zealand," by Mr. A. Hamilton. A discussion followed, in which Sir J. Vogel, Dr. Guy, Sir J. Ferguson, Bart., &c., took part. One of the interesting points of discussion was as to the value of an adult male immigrant. Mr. Hamilton, in his paper, states that "The value of an immigrant in the community has been estimated in the United States at £166 13s. 4d." Sir J. Vogel stated that it had been estimated by a German authority that immigrants—such as those encouraged to go to New Zealand—were worth £200 each to the colony; but he himself thought they were worth more, and doubted the possibility of arriving at anything like a satisfactory estimate. Dr. Farr, however, pointed out that the Journal of the Society contains an estimate on the subject, based upon actual observations, which shows the value of an agricultural labourer, aged twenty-five, to be £246. This calculation, however, was made, it appears, in 1853.

QUEKETT MICROSCOPICAL.

JANUARY 26TH.—H. Lee, Esq., President, in the chair.—A number of donations to the library and cabinet were announced and acknowledged, and four new Members were elected. Mr. T. C. White called attention to sections of the young wood of *Eucalyptus globulus*, exhibited in the room, which were remarkable as showing square pith in the centre of round wood. Mr. H. F. Hailes exhibited and described a new section cutting machine, which, for general purposes, possessed many advantages over other kinds in use, chief amongst which were the facilities for propelling or retracting the substance to be cut with perfect evenness of motion, and by graduations not exceeding the 1-1100th of an inch. The merits of the apparatus were freely discussed, and high praise for simplicity and practical utility was bestowed upon it. A new contrivance for accurately centering objectives, recently designed by Mr. Swift, was exhibited and described by Mr. Ingpen. Mr. B. T. Lowne addressed the meeting "On the Application of the Microscope to Physical Research," and minutely described by means of diagrams an ingenious electrometer, by which extremely small quantities of electric force could be measured under the microscope. The apparatus had been invented and used by Lippmann in Germany for several years, but had only recently been introduced to the notice of English physicists. Mr. Lowne also gave an outline of the paper read by himself before the Royal Society, in which, by the inferences drawn from the effect of black lines upon a white surface, as seen under the microscope and by the unaided eye, the actual values of impressions produced by the energy of different degrees of light upon the retina might be estimated.

ANTHROPOLOGICAL INSTITUTE.

JANUARY 23RD.—Col. Lane Fox, President, in the chair.—A new Member was announced. Col. Fox read his Report to the Anthropometric Committee of the British Association on the 2nd Royal Surrey Militia. Mr. Sweet read a paper "On the Development of Language," and Mr. E. B. Tylor and the president and others took part in the discussion. Papers by Mr. Knowles, "On the Classification of Arrow-Heads," and "On the Portstewart Find," were also read.

January 30th.—*Annual Meeting.*—Col. A. Lane Fox, President, in the chair.—The Treasurer presented his Report, which showed that the finances of the Institute were in a satisfactory condition. The President delivered his Anniversary Address. He gave a short *résumé* of the papers that had been read during the past year. From the Report of the Council, it appeared that there had been an increase of Members in 1876 over deaths and retirements. The following Officers and Council were elected to serve for 1877: President, J. Evans; Vice-Presidents, Prof. G. Busk, Hyde Clarke, Col. Lane Fox, A. W. Franks, F. Galton, and E. B. Tylor; Directors and Hon. Secs., E. W. Brabrook and Capt. H. Dillon; Treasurer, J. Park-Harrison; Council, Dr. J. Beddoe, Dr. J. B. Davis, W. Boyd Dawkins, W. L. Distant, R. Dunn, C. Harrison, H. H. Howorth, Prof. T. M'K. Hughes, Prof. Huxley, A. L. Lewis, Sir J. Lubbock, Bart., R. B. Martin, F. G. H. Price, J. E. Price, Prof. Rolleston, F. W. Rudler, C. R. Des Ruffières, Lord A. Russell, Rev. Prof. Sayce, and M. J. Walhouse.

PROPOSED GERMAN PATENT LAW.—The Emperor of Germany in his speech at the opening of the German Parliament stated that amongst other measures proposed by the Government was a new Patent Bill.

LIFEBOAT SERVICES IN 1876.

THE lifeboats of the National Lifeboat Institition during the storms of the past year rendered signal services in saving life from shipwreck on various parts of the coasts of the United Kingdom, as will be seen from the following list:—Barque Ingleborough, of Hull, 13; schooner Margaritta, of Newquay, 4; schooner St. Elwine, of Falmouth, 6; s.s. Cybele, of Glasgow, and schooner Exhibition, of Colchester, rendered assistance; schooner Bellalie, of Nantes, 6; brig Unition, of Guernsey, 3; schooner Eliza, of Sunderland, and sloop Firm, of London, assisted to save vessels and crews, 8; barque Clifton, of Liverpool, 10; dandy Frank, of Grimsby, 10; brig Speed, of Sunderland, assisted to save vessel and crew, 9; three-masted schooner George Smeed, of Rochester, rendered assistance; barque Brothers' Pride, of St. John's, N.B., 11; schooner Claudine, of Antwerp, rendered assistance; schooner Tweed, of Greenock, 6; brig Fred. Thompson, of Dundee, remained by vessel; s.s. Gustaf, of Gothenburg, 14; barque Mignonette, of London, 14; barque Emily, of Shields, 17; brigantine Trader, of Portaferry, 4; ship Turkestan, of Liverpool, 22; schooner Augusta, of Sunderland, 4; brigantine Lapwing, of Liverpool, assisted to save vessel; schooner Iona, of Belfast, 3; s.s. Rubens, of Liverpool, and barque Coonatto, of London, remained by vessels; fishing-smack William, of Wexford, 6; barque Walker Hall, of Sunderland, 11; ketch; William Pitt, of Poole, 1; fishing-boat Edith, of Lowestoft, assisted to save vessel and 10; schooner Resolute, of Peterhead, 6; brig A.E.M., of Nantes, 8; schooner Lion, of Goole, saved vessel and 4; brig Linwood, of Maryport, rendered assistance; s.s. Bebside, of Newcastle-on-Tyne, 15; schooner Lizzie Morton, of St. Ives, saved vessel and 5; schooner Killin, of Greenock, 5; schooner Anna, of Rendsburg, 4; ship County of Ayr, of Glasgow, 2; smack Victory, of Hull, 5; three fishing cobles, of Staithes, rendered assistance; schooner Wyre, of Fleetwood, 2; schooner Tobina, of Oude Pekela, 5; schooner Elizabeth, of Llanelly, 5; schooner Alabama, of Goole, 2; ketch Elizabeth, of Goole, 2; barque Atlantic, of Swansea, assisted to save vessel and 16; schooner Wells, of Goole, assisted to save vessel and 5; Ferryden fishing-boats, rendered assistance; steam-wherry Bavington, of Newcastle, 4; schooner John, of Runcorn, 3; barque Ilmatar, of Finland, 15; Whitby fishing-boats, 12; ship McNeara, of Boston, U.S., assisted to save vessel; barque Roycroft, Annapolis, N.S., rendered assistance; pleasure-boat Eagle, of Llandudno, 5; brigantine Bridget, of Dungarvan, 8; fishing-boat of Llanaelhaian, 3; fishing-yawl Providence, of Lowestoft, rendered assistance; dandy Dawn, of Grimsby, saved vessel and 3; s.s. Cingalese, of London, remained by vessel; fishing-boat Vivid, of Ferryden, assisted to save vessel and 6; fishing-boat Gem, of Eyemouth, saved vessel and 6; schooner Brothers, of Sunderland, rendered assistance; fishing-boat of West Hartlepool, 3; Arbroath fishing-boats, rendered assistance; brig Macedonia, of Blyth, 7; brig Robert Stevenson, of North Shields, 9; brigantine Maxim, of St. John's N.B., 8; brig Mary Ann, of Whitehaven, 10; Cullercoats fishing cobles rendered assistance; brig Leonie, of Charlotte Town, P. E. I., 4; schooner Maid of Kent, of London, assisted to save vessel and 5; yacht Dragon, of Swanage, 2; three-masted schooner Psyche, of Swansea, assisted to save vessel and 7; fishing coble Morning Star, of Redcar, saved vessel and 3; other Redcar fishing cobles, rendered assistance; barque Auffredy, of Sunderland, 3; Schooner Lady Mary, of Irvine, 4; Prussian schooner Katrina, 4; fishing coble Palestine, of Cullercoats, rendered assistance; dandy Phœbe, of Great Yarmouth, 6; smack Aries, of Cowes, rendered assistance schooner Ton Mawr, of Fowey, saved vessel and 5; ketch Germ, of Goole, 4; barque J. W. Setterwall, of Stockholm, remained by vessel, brig Vulcan, of Whitstable, 10; schooner Gleaner, of Preston, 3; brig Camilla, of Portsmouth, 4; schooner Emerald, of Montrose, 6; barque Mentor, rendered assistance; brig Sinai, of Nantes, 6; barque Ellas, of Spezzia, remained by vessel; Ferryden fishing-boats, rendered assistance; schooner Rover, of Wexford, rendered assistance; fishing-boat of Llanrhystid, saved boat and 3; s.s. Clan Alpine, of Leith, 4; fishing-cole George, of Cullercoats, 1; barque Octavia, of Holmestrand, rendered assistance; schooner Adjutor, of Stavanger, rendered assistance; schooner Jenny Lind, of Whitehaven, 5; a fishing-boat of Teignmouth, 3; barque Beecher Stowe, of South Shields, 10; barque Excelsior, of Sunderland, 11. This long list shows a total of 498 lives rescued by the Society's Lifeboats during the year, in addition to 18 vessels saved from destruction. In the same period the Lifeboat Institution granted rewards for saving 85 lives by fishing and other boats, making a total of 583 lives saved last year, mainly through its instrumentality. It should be also stated that the launches of the Lifeboats, unattended with positive results, have, as in previous years, been during the year very frequent. But on such occasions there is no time for hesitation, and the Lifeboat proceeds out at once to offer help, which, as it often happens, the vessel in distress may not, from various subsequent causes, ultimately need. Altogether, since its formation the Society has contributed to the saving of 24,372 shipwrecked persons, for which services it has granted 968 Gold and Silver Medals, besides pecuniary rewards to the amount of £50,020. The character of these noble Lifeboat services has varied much, some having been performed during the darkness of the night, others in the daytime; but nearly all have been rendered during stormy weather, which would have prevented any ordinary open boat from accomplishing the rescue. Again, it is most gratifying and encouraging to know that, notwithstanding the peril and exposure incurred by the gallant crews last year, only one life was lost from the 256 Lifeboats of the Society, although about 12,000 men were out in them on all occasions during the twelve months. We feel assured that an institution so truly national and benevolent in its character will maintain its firm hold on British sympathy and support; and that while it continues to pursue its course of usefulness with unabated vigour, the support and appreciation of the public will be proportionately liberal. We will only add that contributions in aid of the great and important work of the National Lifeboat Institution are received by all the bankers throughout the United Kingdom, and by the Secretary, at the Institution, 14, John-street, Adelphi, London.

ON THE SEWAGE QUESTION.

By Mr. C. Norman Bazalgette.

The object of the following paper read at a recent meeting of the Institution of Civil Engineers was stated to be twofold. First, to limit and define the proper application of the various systems introduced from time to time for dealing with the sewage of towns. Secondly, to direct attention to certain subordinate questions arising upon the practical operation of such systems. For the purpose of this paper, the following classification had been adopted:—1. Treatment with chemicals; 2. Application of sewage to land, including irrigation and intermittent downward filtration; 3. The dry-earth system; 4. The Liernur or pneumatic system; and 5. Seaboard and tidal outfalls.

1. Treatment with Chemicals. — In this section of the Paper, reference was made in considerable detail to the practical experience of the lime process at Leicester, Tottenham, Blackburn, and Birmingham; the A B C process at Leicester, Leamington, Crossness, Hastings, Southampton, Bolton, and Leeds; the sulphate of alumina process at Coventry; the phosphate of alumina process at Tottenham, Barking, and Hertford; Goodall's process at Leeds; Bird's process at Cheltenham and Stroud; Dugald Campbell's process at Battersea; and Whitthread's process at Tottenham. It was stated, generally, that the experience of these processes was more or less identical with that which had been derived from Holden's, Hille's, Lenks', Suvern's, Scott's, and in fact all other methods in which, by the admixture of chemicals, it was sought to effect the purification of sewage by the precipitation of the dissolved and suspended impurities, and the ultimate realisation of the precipitation in the form of a manure. This experience, coupled with certain opinions of Professor Frankland, Mr. Krepp and Dr. Corfield, which were cited, was relied upon as establishing the following conclusions:—That no chemical process could efficiently deal single-handed with sewage, but must be assisted by subsequent natural or artifical filtration of the treated sewage, and therefore no chemical process *per se* should be adopted for the purification of town sewage. The principal objections to chemical processes, which appeared upon the experience of the places where they had been adopted, and upon which this conclusion was founded were, inefficiency of treatment, cost of treatment, and difficulty of manipulation the accumulations of sewage sludge.

2. Application of Sewage to Land.—The author first considered whether sewage could be made to yield an agricultural profit. The Parliamentary return of 1873 was referred to, and the financial position of the Warwick farm was specifically examined. The question was also raised, whether sewage possessed any fertilising value beyond ordinary water for the purposes of irrigation, and the experience of the Barking farm having been appealed to upon this point, the conclusion was laid down, that no profit ought to be expected from the cultivation of crops by sewage irrigation. The next point discussed was whether any definite standard could be laid down as to the proportion population should bear to acreage in the practice of irrigation, the proportions exhibited by eleven towns being referred to, and it was determined that it was impossible to frame a specific rule. The theory of Intermittent Downward Filtration was then investigated, as based upon the laboratory experiments of the Rivers Pollution Commissioners; and it was argued that the proportions which they had affirmed population might bear to acreage, ranging in the case of one acre drained 6 feet deep from 2,000 to 3,300 persons to the acre, were too high, and were not justified by the experiments. The practice of Downward Filtration at Merthyr was next referred to, and it was shown that the extent of its practical operation there had been exaggerated, and that the results confuted instead of confirming the proportions of the Rivers Pollution Commissioners. The experience of Walton and of Kendal was also reviewed, and the following general conclusion completed this section of the paper:—That where land could be acquired at a reasonable rate, irrigation was the best and most satisfactory known system for the disposal of sewage, but that Intermittent Downward Filtration might be practised where the necessary surface area for broad irrigation could not be obtained. Experience, however, showed that the permanent proportion of population to acreage, where land was drained 6 feet deep, should in no case exceed 500 or 600 persons to an acre.

3. The Dry-Earth System.—The applicability of this system to towns was next considered, and it was shown that it must be supplementary to, and not substitutive of, a water-carriage system, thus enormously increasing the cost of making sanitary provision for towns. The effect of its introduction into the metropolis, as a test case, was illustrated by figures, to prove that it would be superfluous, costly, cumbrous, and impracticable. Indeed its applicability became diminished in the inverse ratio to the increase of population, to which it was proposed to apply it; and though it might be occasionally used with advantage in hamlets or detached buildings and institutions, it was unsuitable for the wants of towns.

4. The Liernur or Pneumatic System.—A description of the mechanical characteristics of this system was first given, and then the experience yielded by its operation at Leyden, Amsterdam, and Dordrecht was specifically analysed. It was supplementary to, and not substitutive of, a water-carriage system, extremely costly, and its mechanism was complicated and liable to get out of order. The accumulation of sewage residuum in the central reservoir, and its subsequent decanting into barrels, were operations which could not fail to be objectionable and offensive. Its appliances were therefore not suitable for a high-class community, and no return from the manufacture of "poudrette" could be expected. In conclusion, it was urged that the system was of such a character that, though it might have a partial success in the tide-locked cities of the Hague, where no system of sewerage was available, it should never be imported into an English town.

5. Seaboard and Tidal Outfalls.—The first point considered was the return of the sewage of seaboard towns upon the beach; and it was maintained that where care had been taken to determine by float observations the force and set of the currents to which the sewage was to be committed, there was no difficulty in preventing such a result. The sea constituted the most natural and economical outfall for the sewage of towns situated upon it, and such means of outfall should be adopted. With regard to sewage outfalls upon the tidal portions and estuaries of rivers, there ought to be, arguing from the experience of the Metropolitan outfalls, and assuming that proper precautions were taken in the selection of the outfall, and the exclusion of silt from the sewers, no danger of the silting up of the navigable channel.

A NOVEL HYDRAULIC RAILWAY SYSTEM.

A new mode of travelling has lately been invented, which the inventors claim to be applicable to any mining country where flumes exist, or which may be used wherever a stream of water of sufficient velocity of current can be enclosed for suitable distance. The device involves a carriage driven entirely by outside power; and paradoxical as it may appear, it is caused to travel either in the same direction as the force, or diametrically opposite thereto, while the direction of application of the power remains unchanged. In short, it is a carriage which travels up stream, impelled by no other force than that of the current. The invention is claimed to be practicable; it has already been used in California for transportation on a small scale; and judging from experiments, the inventors state that a car for the transportation of passengers may thus be driven at considerable speed, depending of course upon the head of water.

The carriage rests on ordinary flanged wheels which traverse rails laid on the edges of the flume. On the axles are attached paddle wheels, which correspond in shape to the section of the flume, and are acted upon by the current therein. It is clear that the current turning the paddles will so rotate the wheels of the vehicle, which will consequently move in a direction opposite to that of the current. When it is desired to move in the same direction as the current, the paddles are stayed stationary, and the water impels the car down stream.

A test trial with a working model, we learn, has demonstrated the capacity of the carriage to carry about 8lbs. of load (exclusive of its own weight) for every inch (miners' measure) of water in the flume. A flume of 600 inches of water will therefore furnish power to transport a load of about 5,000lbs. up stream, on any grade from 4 to 20 inches to the rod, at a speed of from 4 to 8 miles per hour; a less grade causes a slower run. The strength of flume and car is the only measure of capacity of the device in going down stream, and the velocity may extend to any speed desired, being governed only by the grade and the speed of the flow of water. The rate of travel is regulated by brakes; and the paddle wheels are attached to the shafts with clutch gear, to be unshipped at pleasure.

The frame is built in two sections, and the platform rests on anti-friction balls, for the purpose of turning curves with but little friction. By double gearing, the speed may be greatly increased for passenger transportation, of course at the expense of power.—*Scientific American.*

RESPONSIO.

Oh, part from thee and lose thy light,
  Tho' thou canst ne'er be mine?
No, cling to thee as ivy clings,
  And fondly as the vine!
Oh, rather let my soul not seek
  Her bright ethereal home,
The deer her shade, the lark her song,
  The moon her virgin home!
Ere, in the fulness of my heart
  Thy spirit's gleam should be
Enshrined alone in fancied art,
  Nor weep to part from thee!

Oh, view no more thy sweet sad eyes,
  Oft lit in fondest love!
Nor seek at eve to hover near,
  As o'er her nest the dove!
Oh, rather let not morning break,
  Nor evening twilight gleam;
The stars illume the silent night,
  And flowers the rippling stream!
Ere kindred spirits born to breathe
  As one, should severed be,
And he who woos thy gentle light,
  Could part from thine and thee!

HENRY GEORGE HELLON.

SULPHUR FOR SCARLET FEVER.

DR. HENRY PIGEON writes to the *Lancet* as follows:—"The marvellous success which has attended my treatment of scarlet fever by sulphur induces me to let my medical brethren know of my plan, so that they may be able to apply the same remedy without delay. All the cases in which I used it were very well marked, and the epidermis on the arms in each case came away like the skin of a snake. The following was the exact treatment followed in each case:—Thoroughly anoint the patient twice daily with sulphur ointment; give five to ten grains of sulphur in a little jam three times a day. Sufficient sulphur was burned, twice daily (on coals on a shovel), to fill the room with the fumes, and, of course, was thoroughly inhaled by the patient. Under this mode of treatment each case improved immediately, and none were over eight days in making a complete recovery, and I firmly believe in each it was prevented from spreading by the treatment adopted. One case was in a large school. Having had a large experience in scarlet fever last year and this, I feel some confidence in my own judgment, and I am of opinion that the very mildest cases I ever saw do not do half so well as bad cases do by the sulphur treatment, and as far as I can judge, sulphur is as near a specific for scarlet fever as possible."

F. PLATEAU, in *Les Mondes* for February 1st, gives a brief account of the death of Augustus Bellynck, at the age of sixty-three. He has been Professor of Zoology and Botany in the Collége de Notre-Dame de la Paix, at Namur, since 1843. His principal works were his "Flore de Nam ur" (1855), his "Course de Zoologie" (1864-65), and a "Course de Botanique," a work which quickly passed through two editions between 1874-79.

THE ARTIZANS AND INVENTORS PATENT LAW AMENDMENT COMMITTEE held a meeting on Thursday, 22nd February; Mr. T. Mottershead in the chair. After a review of the clauses of the New Patent Bill, the meeting adjourned for definitive consideration thereof till a future day, of which due notice was to be given.

CHRONOLOGICAL LIST OF
APPLICATIONS FOR LETTERS PATENT.

⁂ In this list (Com. means Invention communicated from abroad.

Further information, as to the progress of these Patents by Notice to Proceed, Sealing, and Specifying, can be obtained at the Office, 21, Cockspur-street, Charing Cross.

On September 16th.—3622 to 3639.—W. C. Pellatt. Means or apparatus for folding wrappers or covers around cakes of blacking or other material.—C. W. Harrison. Preserving metals, wood, stone, and other substances or materials from decay and fouling.—H. Guthrie. Pressing machines generally used for solidifying granular substances, such as fire-clay, coal-dust, or any other material of like nature, for making bricks, tiles, fuel blocks, or similar matters.——A. C. Henderson. Revolving metal shutters for shop fronts or windows (com.)—F. Wirth. Packing rings and the method of and apparatus for manufacturing the same (com.)—A. Jack. Self-delivery reaping machines.—J. Garlick. Kilns. W. Ibbotson. Callendering, glazing, or surface colouring paper or other goods.—J. J. Jarves. Heating steam generators, boilers, furnaces, and stoves.—J. W. Swan. Apparatus for preparing stencils for autographic printing.—C. R. Mitchell. Fishing gear winch, or arrangement of mechanism for heaving in herring or other fishing nets, trawl ropes, and deep-sea fishing or other lines.—E. A. Cowper. Centrifugal machines.—W. Walton. Apparatus for grinding wire cards.—F. A. Paget. Producing the ornamental "clocking" on hosiery goods (partly com.)—W. Lowe. Lamps for burning kerosine and other light or volatile oils (com.)—R. S. Newall. Apparatus for grinding corn and other substances.—C. H. Wetzel. Locks or fastenings for boxes, specially applicable for boxes for cigar lighters and matches.—F. Virtue. Machinery for measuring, compressing, and moulding oil-seeds or other materials, now commonly compressed wholly in hydraulic presses.

On September 18th.—3640 to 3652.—C. E. H. Rogers. Apparatus for disinfecting clothing and other similar articles.—A. Turnbull. Apparrtus to be used in ballot.—W. Howitt. Roller skates.—T. F. Cocker, jun., and B. F. Cocker. Mode or method of hardening and stiffening steel wire and steel strips.—G. Nesbitt. Photograph tinting apparatus.—J. Y. Smith. Apparatus for producing a draft or current of air or other fluid, and for similar purposes.—C. D. Abel. Steam boilers (com.)—J. Simpson. Metallic drums or casks, and lids or closers therefor.—H. Brittain. Windows for carriages and in fastenings for the same.—H. Hirsch. Heating fluids, as water or others, and the generating steam therefrom.—H. J. Distin. Machine for manufacturing an apparatus to produce sound, as a substitute for a castanet.—J. H. Small and F. Marley. Modes and means of or arrangement of mechanism for recording the time of arrival at and departure of tramway cars from stations.—W. R. Lake. Axles and axle-boxes (com.) (Complete specification.)

On September 19th.—3653 to 3673.—J. Farran and J. Walsh. Self-acting mules used for spinning cotton, flax, wool, and other fibrous materials.—W. F. Smith and A. Coventry. Construction of carriers, pedestals, pulleys, and couplings for shafting, and mechanism for counter-shafting, and lathes or machinery for making shafts.—W. Foulis. Gas governor.—S. B. Wilkins. Ball-cock hydrants.—W. March. Raising coal or other article by a double action hoisting engine, whereby one stroke of the piston in either direction raises the goods, while the descending empty cage, tub, or other receptacle acts as a partial counterbalance to the ascending loaded cage, tub, or other receptacle, so that it is only necessary to exert a power sufficient to raise the net weight of the goods required to be lifted.—W. A. Brice. Self-detaching apparatus for disengaging ships' boats and other purposes.—W. Morgan-Brown. Looms for pleating and diapering all kinds of cloth and tissues (com.)—G. E. A. Hoermann. Means and apparatus for regulating reciprocating motion in motor engines and other machinery.—J. H. Johnson. Steam boilers (com.)—T. F. Hunt. Apparatus for making lawn tennis courts and other surfaces.—G. Bray. Machinery or apparatus for cutting, turning, or shaping wood.—W. H. Dutton. **Manufacture of soles for boots and shoes.—R.** H. Tweddell, J. Platt, and J. Fielding. Apparatus and means for the transmission of pressure to hydraulic machine tools, to facilitate their application to the work on which they are to be applied.—S. Hill. Sash fastener for windows, also applicable for securing casements, cupboards, or doors, or for other similar purposes.—C. F. Grimmett. Manufacture of skelps and tubes.—W. R. Lake. Combination of articles of confectionary, and the like, with musical instruments (com.)—C. H. Everett. Seat.—C. A. Faure. Thermo-electric generators and electro-motors.—C. W. Wallis. Certain composition called "Idrofuga," to be used for paving of every description, for terraces, roads, streets, paths, skating rinks, and every conceivable surface work; for walls, pillars, mantel-pieces, reservoirs, and all hydraulic works whatsoever, &c., &c., &c., &c. (com.)—W. H. Murphy. Head for paper barrels. (Complete specification.)—A. Greenwood, G. E. Davis, and J. J. Speakman. Collecting and treating human excreta, urine, and house and general refuse, for the manufacture of useful products therefrom, and apparatus or appliances employed therein.

On September 20th.—3674 to 3691.—R. Harris. Purification of gas.—E. Cuyer. Apparatus for raising, by the means of compressed air, submerged ships or other vessels.—N. Seward, M.D. Apparatus for breathing warm air.—J. Keighley. Fog signalling on railway or tramways, and apparatus therefor.—E. E. Wigzell and C. Halsey. Engines for propelling steam launches and yachts, and for other purposes.—W. B. Nation and W. Symington. Treating paraffin.—A. M. Clark. Air and water proof fabrics (com.)—J. Hemingway. "Scribbling" and carding engines.—S. Hancock and W. Soar. Furnaces and flues of steam boilers.—H. Brooks. Action of upright pianofortes.—F. Barnes. Means or apparatus to be employed in connecting and disconnecting railway and tramways rolling stock.—W. R. Lake. Fans for protecting food from insects, and for similar purposes (com.)—L. A. Brode. Manufacture of artificial marble or stone.—N. Clayton and J. Shuttleworth. Road locomotives or traction engines.—W. Smith and R. R. Harper. Method of arranging and disposing the connections of electro-magnetic signalling instruments.—J. F. Swinburn. Breech-loading small arms.—H. H. Murdoch. Steam boilers (com.)—W. E. Newton. Railway sleepers (com.)

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London: Printed by H. W. FOSTER, 14, Fetter Lane, Fleet Street. E.C.; and Published for the Proprietors at 21, Cockspur Street, Charing Cross; and Sold by W. KENT & Co., 23, Paternoster Row, and SAMPSON LOW, SON, & MARSTON, English, American, and Colonial Booksellers and Publishers, Crown Buildings, 188, Fleet Street, London, E.C.

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